

# TECHNICAL MEMORANDUM

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**To:** Mr. Michael Contreras

**Date:** July 6, 2009

**Project:** Stock water pond – License 12023

**From:** David Durette, P.E.

**Re:** Pond Storage Capacity

**CC:** Tom & Stephenie Gregory

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## INTRODUCTION

This technical memorandum has been prepared to present an evaluation of the pond storage capacity of the stock water pond owned by Mr. and Mrs. Gregory.

## POND LOCATION AND DESCRIPTION

The stock water pond is located at 17835 Cross Creek Drive, Cottonwood, California. The assessors parcel number is 007-400-014 for this address. The pond is located in Sec.3, Township 28 north, Range 5 West of the Mount Diablo Baseline and Meridian. The pond's license number is 12023 and permit number is 17948. Per the license, the maximum allowable storage of the pond is 14 acre-feet.

The pond is formed by an earthen structure located approximately 1,400 feet south and 2,250 feet west of the northeast corner of section 3. The earthen structure is located on an unnamed tributary of Mitchell Gulch.

## SURVEY METHODOLOGIES

A topographical survey on the pond, earthen structure, overflow and surrounding area was conducted on June 6, 2009. A Sokkia SET3110 electronic total station was used to record approximately 225 data points in and around the pond. Two control points were set. An initial elevation of 600' was given to control point #1 and an elevation of 597.62 was calculated for control point #2. From these two points the entire pond and surrounding area were visible. Data points in the pond were collected through the uses of a 25' tall rod and a boat.

Upon completion of the survey, the data points were downloaded to AutoCAD Land Desktop Companion and processed. A triangulated irregular network (TIN) was created using the data points to represent the physical land surface above and below the water surface.

Once the TIN was created, volumes were calculated at various elevations to determine the water surface elevation needed to store 14 acre-feet. A composite method was used to conduct the volume calculations. The composite method re-triangulates a new surface based on points from both surfaces. It uses the points from both surfaces, as well as any location where the triangle edges between the two surfaces cross. The new composite surface elevations are based on the difference between the elevations of the two surfaces which to gives an accurate pond volume.

## OUTLET PIPE SIZING

The pond can be modeled as an open vented tank that is draining through an orifice. As the static head over the orifice decreases with time so does the flow through the orifice. The time it takes to drain the pond is given by the equation:

$$t = 2A_t((z_1)^{1/2} - (z_2)^{1/2}) / C_d A_o (2g)^{1/2} \text{ (Civil Engineering Reference Manual, Lindburg 7th Ed.)}$$

where:

$A_t$  = Average area of the pond – 156,816 sf.

$Z_1$  = Water surface height at overflow – 5.685' ft.

$Z_2$  = Water surface height at center of outlet orifice – 0.165 ft.

$C_d$  = Orifice Coefficient – 0.72 (Table 17.5, Civil Engineering Reference Manual, Lindburg 7th Ed.)

$A_o$  = Area of orifice – 0.26 sf.

$g$  = gravity – 32.2 ft/sec.<sup>2</sup>

$$t = 2(156,816)((5.685)^{1/2} - (0.165)^{1/2}) / 0.72(0.26)(64.4)^{1/2} = 412,975 \text{ seconds} = 6,883 \text{ min.} = 114.7 \text{ hours}$$

Time to discharge water from pond from overflow structure to outlet pipe = 4.78 days

## CONCLUSIONS/RECOMMENDATIONS

In consideration of the above analysis, the water surface elevation of the pond should be at 587.75' so as not to exceed 14 acre-feet of storage and 4" diameter outlet pipe will be sufficient.

## ATTACHMENTS

Figure 1 – Location Map

Figure 2 – Topographic Survey of Pond and Vicinity



# LOCATION MAP

POND STORAGE CAPACITY

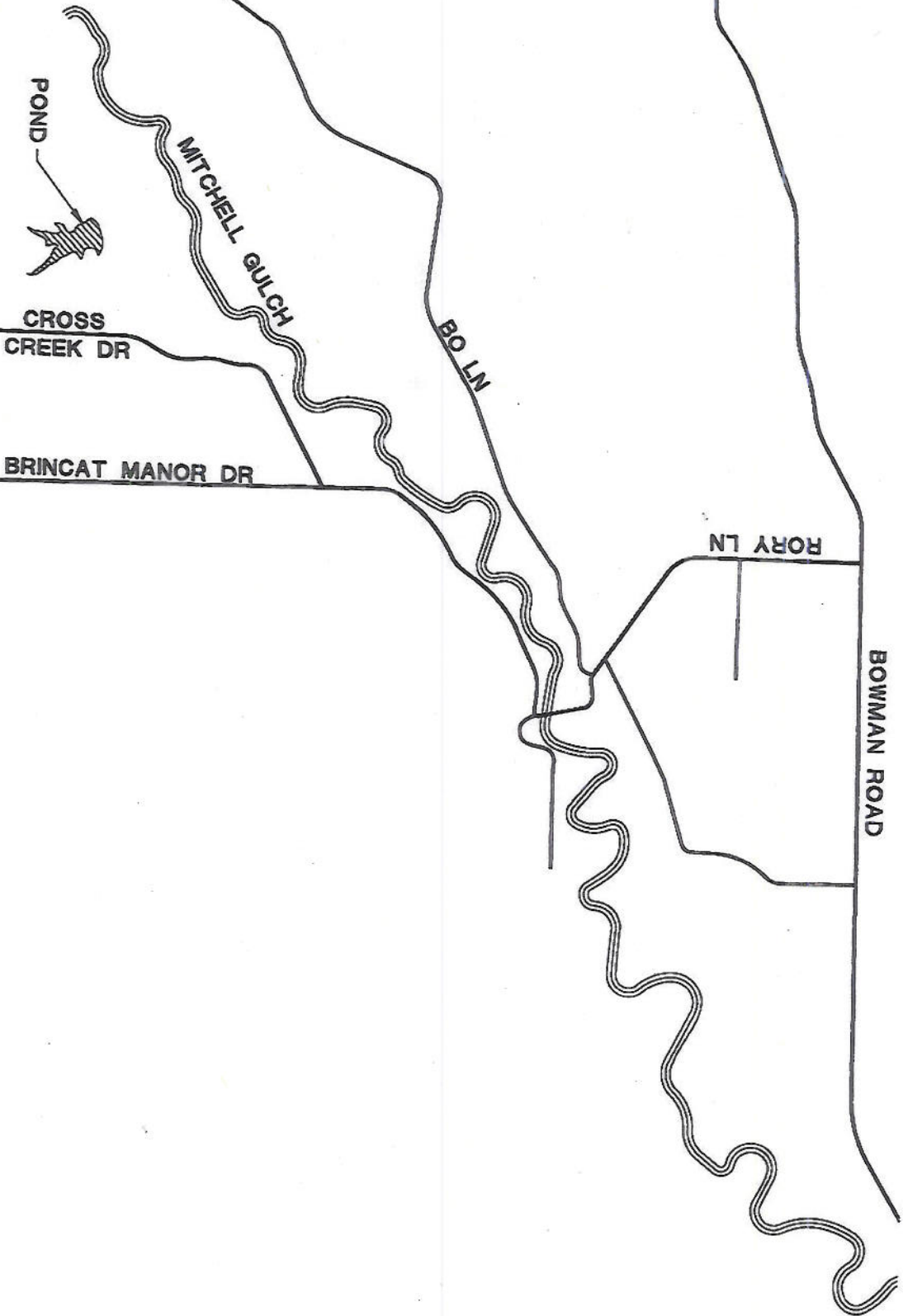


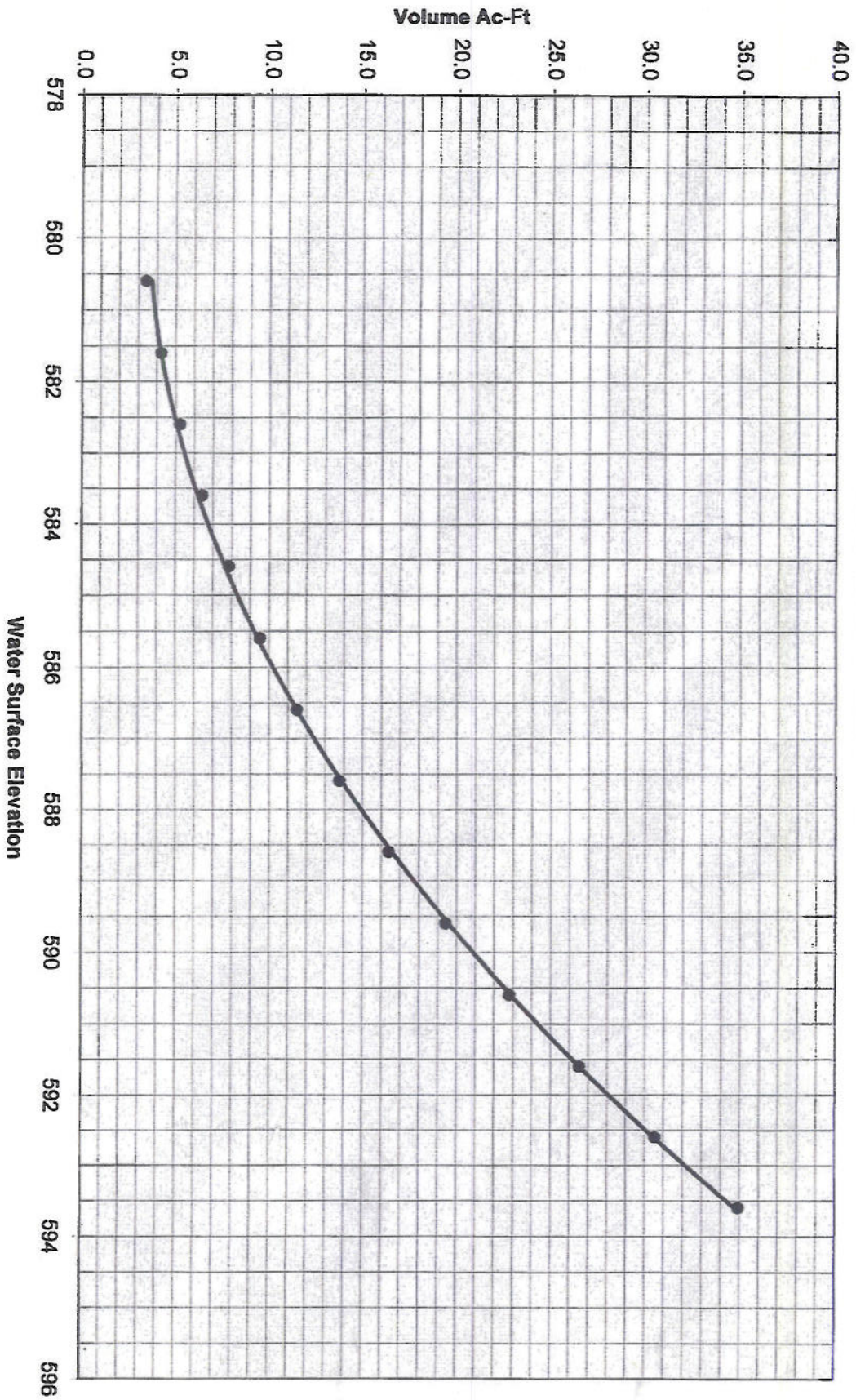
Figure 1





### Gregory Stock Pond Volume

$$\text{Volume} = 0.1559x^2 - 180.66x + 52344$$



### Gregory Stock Pond Volume

Water Surface Elevation	Volume CY	Volume Ac-Ft
593.6	56325	34.9
592.6	49247	30.5
591.6	42740	26.5
590.6	36768	22.8
589.6	31318	19.4
588.6	26422	16.4
587.6	22175	13.7
586.6	18502	11.5
585.6	15336	9.5
584.6	12624	7.8
583.6	10327	6.4
582.6	8396	5.2
581.6	6804	4.2
580.6	5458	3.4



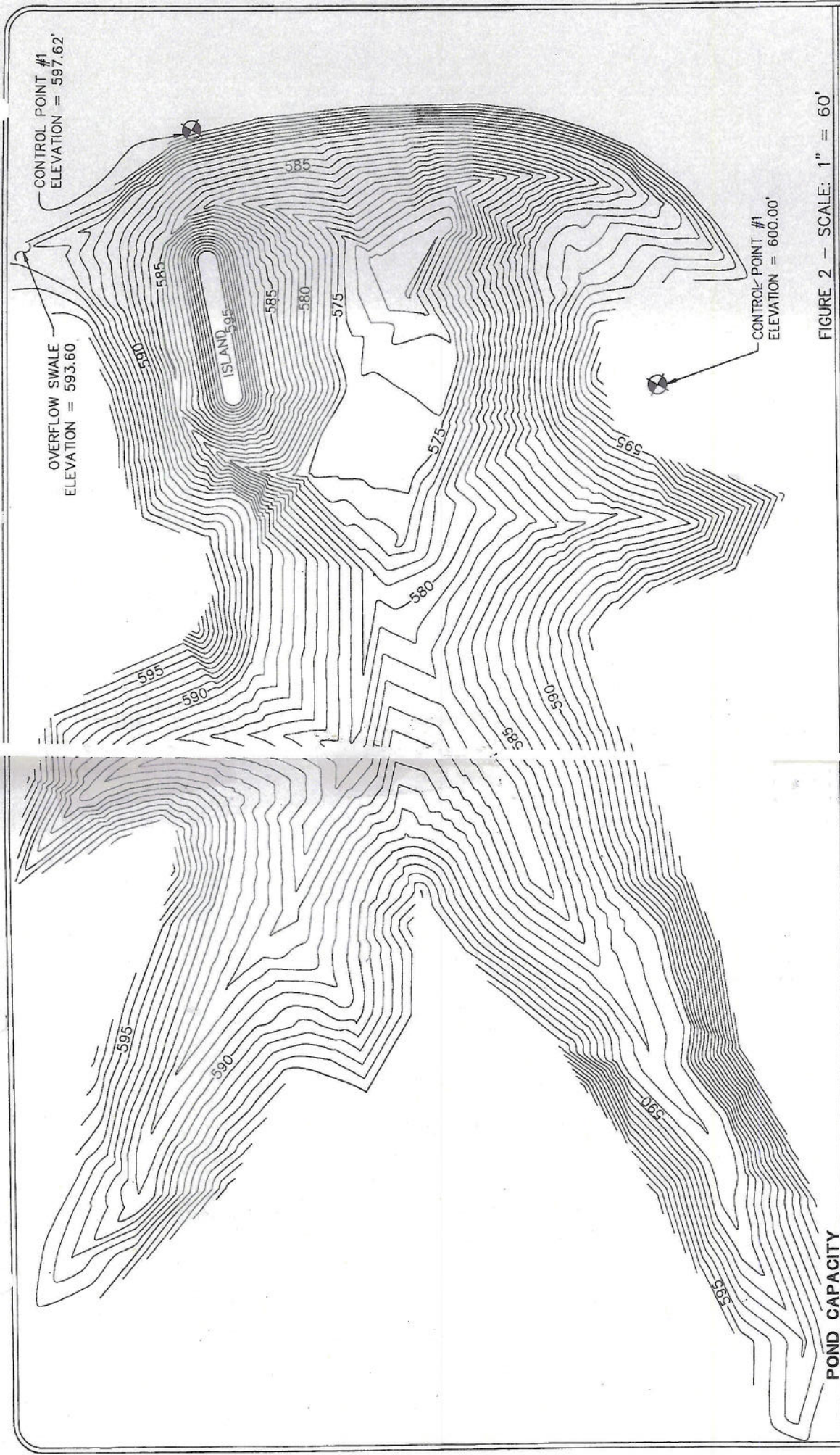


FIGURE 2 - SCALE: 1" = 60'



# TOPOGRAPHIC SURVEY OF POND AND VICINITY



Attachment # 2



STATE OF CALIFORNIA  
STATE WATER RESOURCES CONTROL BOARD

DIVISION OF WATER RIGHTS

## License for Diversion and Use of Water

APPLICATION 26029  
Page 1 of 2

PERMIT 17948

LICENSE 12023

**THIS IS TO CERTIFY, That** William Gregory and Mardie Gregory  
10181 Churn Creek Road  
Redding, California 96001

have made proof as of June 26, 1985 (the date of inspection)  
to the satisfaction of the State Water Resources Control Board of a right to the use of the water of  
an Unnamed Stream in Tehama County

tributary to Mitchell Gulch thence South Fork Cottonwood Creek thence Cottonwood  
Creek thence Sacramento River

for the purpose of Stockwatering use

under Permit 17948 of the Board and that the right to the use of this water has been perfected  
in accordance with the laws of California, the Regulations of the Board and the permit terms; that the  
priority of this right dates from June 19, 1979 and that the amount of water to which  
this right is entitled and hereby confirmed is limited to the amount actually beneficially used for the stated  
purposes and shall not exceed fourteen (14) acre-feet per annum to be collected from  
December 1 of each year to March 1 of the succeeding year.

This license does not authorize collection of water to storage outside of the  
specified season to offset evaporation and seepage losses or for any other  
purpose.

(0000005)

After the initial filling of the reservoir, licensee's right under this license  
extends only to water necessary to keep the storage reservoir full by replacing  
water beneficially used and water lost by evaporation and seepage, and to  
refill if emptied for necessary maintenance or repair.

(0000041)

THE POINT OF DIVERSION OF SUCH WATER IS LOCATED:

This license is subject to the continuing authority of the State Water Resources Control Board to reduce the amount of water named in the license upon a finding by the Board that the amount is in excess of that reasonably needed to be held in storage for the authorized uses. No action will be taken by the Board without prior notice to the owner and an opportunity for hearing.

(0000042)

This license is subject to prior rights. Licensee is put on notice that during some years water will not be available for diversion during portions or all of the season authorized herein. The annual variations in demands and hydrologic conditions in the Sacramento River Basin are such that in any year of water scarcity the season of diversion authorized herein may be reduced or completely eliminated on order of this Board made after notice to interested parties and opportunity for hearing.

(0000090)

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*Licensee shall allow representatives of the Board and other parties, as may be authorized from time to time by the Board, reasonable access to project works to determine compliance with the terms of this license.*

*The quantity of water diverted under this license is subject to modification by the State Water Resources Control Board if, after notice to the licensee and an opportunity for hearing, the Board finds that such modification is necessary to meet water quality objectives in water quality control plans which have been or hereafter may be established or modified pursuant to Division 7 of the Water Code. No action will be taken pursuant to this paragraph unless the Board finds that (1) adequate waste discharge requirements have been prescribed and are in effect with respect to all waste discharges which have any substantial effect upon water quality in the area involved, and (2) the water quality objectives cannot be achieved solely through the control of waste discharges.*

*Pursuant to California Water Code Sections 100 and 275 and the public trust doctrine, all rights and privileges under this license, including method of diversion, method of use, and quantity of water diverted, are subject to the continuing authority of the State Water Resources Control Board in accordance with law and in the interest of the public welfare to protect public trust uses, prevent waste, unreasonable use, unreasonable method of use, or unreasonable method of diversion of said water.*

*This continuing authority of the Board may be exercised by imposing specific requirements over and above those contained in this license with a view to minimizing waste of water and to meeting the reasonable water requirements of licensee without unreasonable draft on the source. Licensee may be required to implement such programs as (1) reusing or reclaiming the water allocated; (2) using water reclaimed by another entity instead of all or part of the water allocated; (3) restricting diversions so as to eliminate agricultural tailwater or to reduce return flow; (4) suppressing evaporation losses from water surfaces; (5) controlling phreatophytic growth; and (6) installing, maintaining, and operating efficient water measuring devices to assure compliance with the quantity limitations of this license and to determine accurately water use as against reasonable water requirements for the authorized project. No action will be taken pursuant to this paragraph unless the Board determines, after notice to affected parties and opportunity for hearing, that such specific requirements are physically and financially feasible and are appropriate to the particular situation.*

*The continuing authority of the board also may be exercised by imposing further limitations on the diversion and use of water by the licensee in order to protect public trust uses. No action will be taken pursuant to this paragraph unless the board determines, after notice to affected parties and opportunity for hearing, that such action takes into account the public interest and is necessary to protect public trust uses. All such actions shall conform to the standard of reasonableness contained in Article X, Section 2 of the California Constitution.*

*Reports shall be filed promptly by licensee on appropriate forms which will be provided for the purpose from time to time by the Board.*

*The right hereby confirmed to the diversion and use of water is restricted to the point or points of diversion herein specified and to the lands or place of use herein described.*

*This license is granted and licensee accepts all rights herein confirmed subject to the following provisions of the Water Code:*

Section 1625. Each license shall be in such form and contain such terms as may be prescribed by the Board.

Section 1626. All licenses shall be under the terms and conditions of this division (of the Water Code).

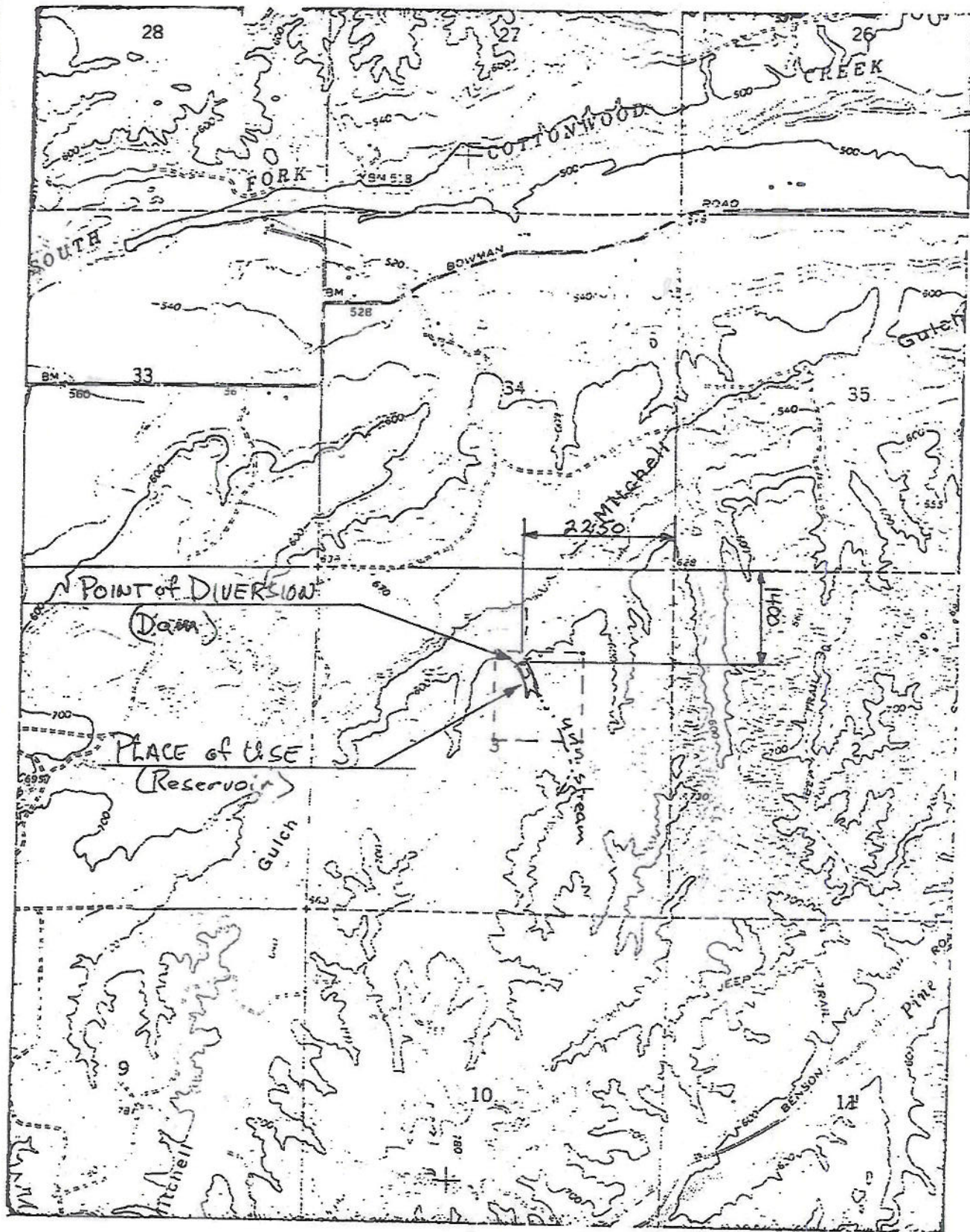
Section 1627. A license shall be effective for such time as the water actually appropriated under it is used for a useful and beneficial purpose in conformity with this division (of the Water Code) but no longer.

Section 1628. Every license shall include the enumeration of conditions therein which in substance shall include all of the provisions of this article and the statement that any appropriator of water to whom a license is issued takes the license subject to the conditions therein expressed.

Section 1629. Every licensee, if he accepts a license does so under the conditions precedent that no value whatsoever in excess of the actual amount paid to the State therefor shall at any time be assigned to or claimed for any license granted or issued under the provisions of this division (of the Water Code), or for any rights granted or acquired under the provisions of this division (of the Water Code), in respect to the regulation by any competent public authority of the services or the price of the services to be rendered by any licensee or by the holder of any rights granted or acquired under the provisions of this division (of the Water Code) or in respect to any valuation for purposes of sale to or purchase, whether through condemnation proceedings or otherwise, by the State or any city, city and county, municipal water district, irrigation district, lighting district, or any political subdivision of the State, of the rights and property of any licensee, or the possessor of any rights granted, issued, or acquired under the provisions of this division (of the Water Code).

Section 1630. At any time after the expiration of twenty years after the granting of a license, the State or any city, city and county, municipal water district, irrigation district, lighting district, or any political subdivision of the State shall have the right to purchase the works and property occupied and used under the license and the works built or constructed for the enjoyment of the rights granted under the license.





OWNER TOM + Stephanie Gregory

Section Township Range  
SW 3 28 N

MT. Diablo Btm

SOURCE Unnamed Stream

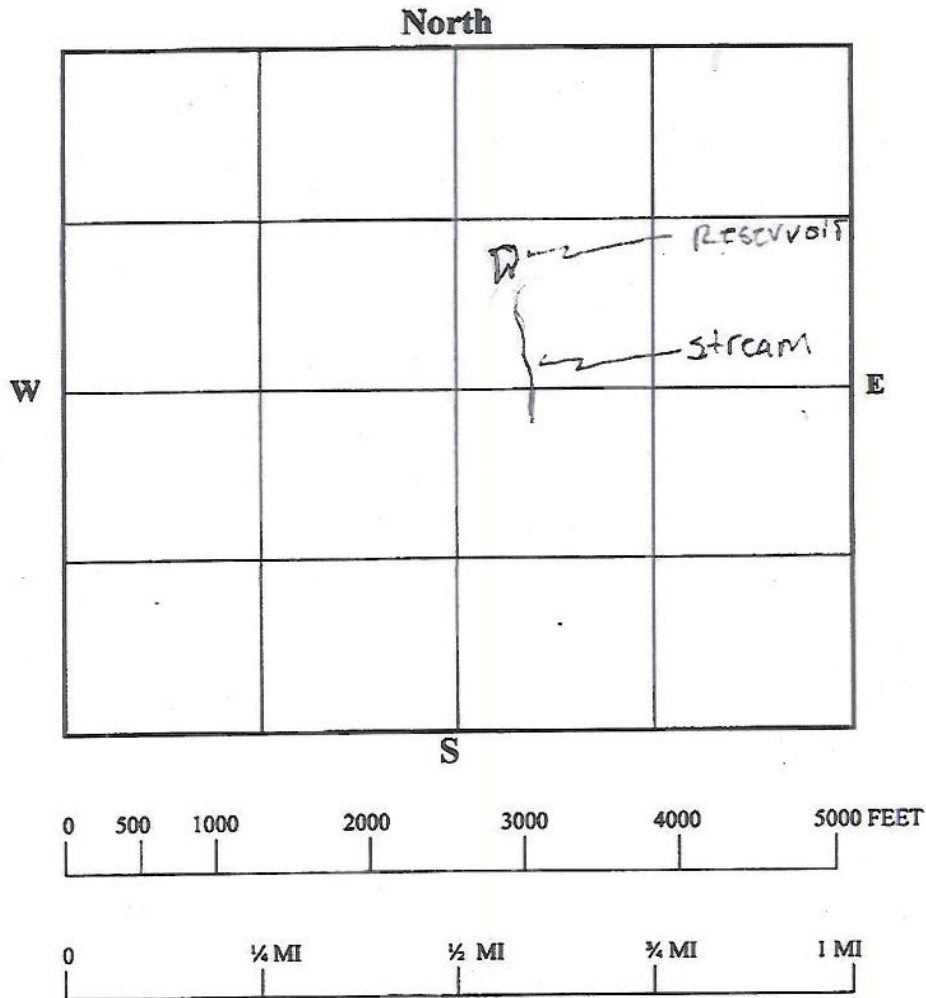
STATE OF CALIFORNIA  
STATE WATER RESOURCES CONTROL BOARD  
DIVISION OF WATER RIGHTS



**11. MAP**

Please complete legibly, with as much detail as possible, or attach a suitable alternative. See example in instruction booklet.)

SECTION(S) 5 W TOWNSHIP 3 RANGE 22 N, Mt. Diablo B. & M.

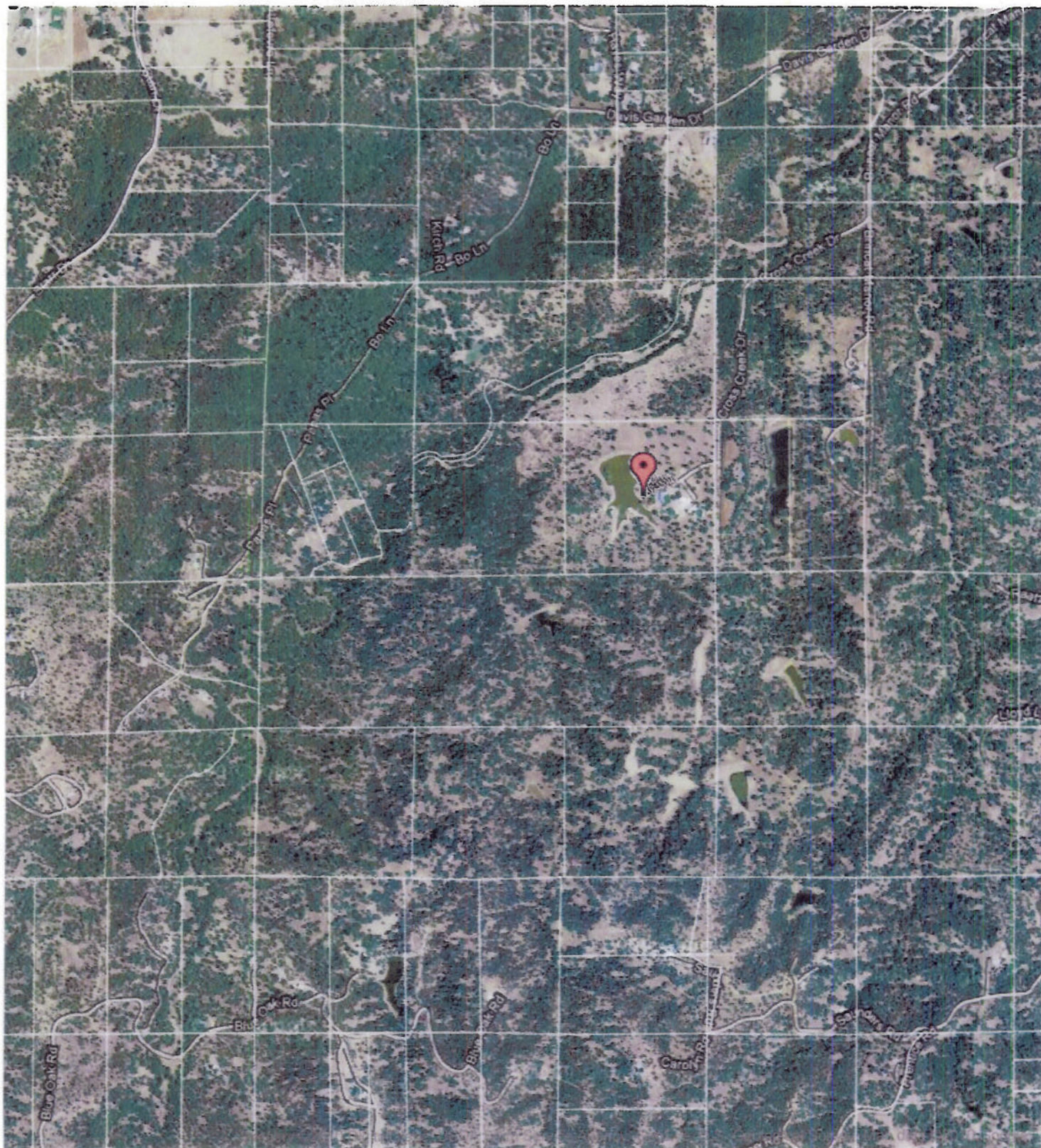


- (1) Show location of the stream or spring, and give name.
- (2) Locate and describe the point of diversion (i.e. the point at which water is to be taken from the stream or spring) in the following way: Begin at the most convenient known corner of the public land survey, such as a section or quarter section corner (if on unsurveyed land more than two miles from a section corner, begin at a mark or some natural object or permanent monument that can be readily found and recognized) and measure directly north or south until opposite the point which it is desired to locate; then measure directly east or west to the desired point. Show these distances in figures on the map as shown in the instructions.
- (3) Show location of the main ditch or pipeline from the point of diversion.
- (4) Indicate clearly the proposed place of use of the water.

Additional copies of this form and water right information can be obtained at [www.waterrights.ca.gov](http://www.waterrights.ca.gov)



Attachment #5



ENPLAN Parcel Viewer - <http://pv.enplan.com/>





California Natural Resources Agency  
DEPARTMENT OF FISH AND GAME  
Northern Region  
601 Locust Street  
Redding, CA 96001  
[www.dfg.ca.gov](http://www.dfg.ca.gov)

Attachment #6  
ARNOLD IWARZENEGGER, Governor  
JOHN McCAMMAN, Director



May 27, 2010

Thomas Gregory  
17835 Cross Creek Drive  
Cottonwood, California 96022

Subject: No Lake or Streambed Alteration Agreement Needed  
Notification No. 1600-2010-0147-R1  
Unnamed Tributary to Mitchell Gulch

Dear Mr. Gregory:

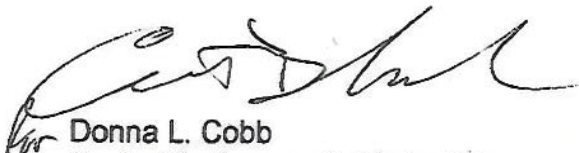
The Department of Fish and Game (Department) has reviewed your Lake or Streambed Alteration Notification (Notification). We have determined that your project is subject to the notification requirement in Fish and Game Code Section 1602, including payment of the notification fee.

The Department has also determined that your project will not substantially adversely affect an existing fish or wildlife resource. As a result, you will not need a Lake or Streambed Alteration Agreement for your project. You are responsible for complying with all applicable local, state, and federal laws in completing your work. A copy of this letter and your notification with all attachments should be available at all times at the work site.

Please note that if you change your project so that it differs materially from the project you described in your original Notification, you will need to submit a new Notification and corresponding fee to the Department.

Thank you for notifying us of your project. If you have any questions, please contact Michael Dege at (530) 225-2309 or [mdege@dfg.ca.gov](mailto:mdege@dfg.ca.gov).

Sincerely,

  
Donna L. Cobb  
Senior Environmental Scientist

cc: Jane Vorpagel

# TECHNICAL MEMORANDUM

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**To:** Mr. Tom Gregory

**Date:** September 22, 2010

**Project:** Stock water pond application

**From:** David Durette, P.E.

**Re:** Water Availability Analysis

**CC:**

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## INTRODUCTION

This technical memorandum has been prepared to present an evaluation of the water availability for the expansion of the Gregory pond utilizing the criteria and methodologies of a 1260(K) analysis as presented in Attachment A.

## POND LOCATION AND DESCRIPTION

The stock water pond is located at 17835 Cross Creek Drive, Cottonwood, California in Tehema county. The assessors parcel number is 007-400-014 for this address. The pond is located in Sec.3, Township 28 north, Range 5 West of the Mount Diablo Baseline and Meridian. The pond is located on an unnamed tributary of Mitchell Gulch. Mitchell Gulch is a tributary of Cottonwood Creek which flows to the Sacramento River.

## WATER AVAILABILITY ANALYSIS

The formula  $Q_E = Q_1 - Q_0$  was used.

### Downstream Water Rights

The State Water Resource Control Board's eWRIMS online database ([http://www.waterboards.ca.gov/water\\_issues/programs/ewrims](http://www.waterboards.ca.gov/water_issues/programs/ewrims)) was utilized to search for downstream water right holders. None were identified therefore  $Q_0 = 0$ .

### Watershed Area

The tributary area of the pond was determined using the Mitchell Gulch Quadrangle, California, 7.5 Minute Series Topographic Map. A map of the tributary area is contained in Figure 1. The tributary area for the pond is 39.3 acres.

### Runoff Coefficient

The runoff coefficient "C" utilized in the 1260(k) analysis is comprised of four variables: Topography, Soil Saturation, Vegetal Cover and Surface Water.

The topographic map used to determine tributary area was also used to determine the slope distribution for the entire watershed. A map of the slope analysis is contained in Figure 2. It was determined that 8.7% of the area is steep, 62.4% is hilly, 21.4% is rolling and 7.4% is relatively flat. These percentages were used to determine a weighted "C" value for the entire water shed.



$$C_{\text{SLOPE}} = 0.33(0.087) + 0.24(0.624) + 0.18(0.214) + 0.12(0.074) = 0.23$$

The soil saturation is dependant on the soil type. The Web Soil Survey contained on the NRCS web site (<http://websoilsurvey.nrcs.usda.gov/app/>) was utilized to determine the soil types contained in the watershed. Figure 3 contains a map of the watershed and underlying soil types. The predominant soil type is a gravelly loam which yields a  $C_{\text{SOIL}} = 0.08$ .

The vegetal cover of the site is predominately low seasonal grasses intermixed with blue oaks and bushes. Using the criteria contained in Attachment A,  $C_{\text{VEG}} = 0.08$ .

The watershed has negligible surface depressions with well defined drainage ways. Using the criteria contained in Attachment A,  $C_{\text{SW}} = 0.10$ .

The overall C value is equal to the sum of the four component values –  $C = C_{\text{SLOPE}} + C_{\text{SOIL}} + C_{\text{VEG}} + C_{\text{SW}}$

$$C = 0.23 + 0.08 + 0.08 + 0.10 = \underline{0.49}$$

#### Average Annual Precipitation

The average annual precipitation was determined using the Department of Water Resources website [http://cdec.water.ca.gov/snow\\_rain.html](http://cdec.water.ca.gov/snow_rain.html). The nearest gauging station is Davis Ranch (DVR) which is located approximately 3.2 miles northwest of the pond location. The DVR station is located at an elevation of 550' which is comparable to average watershed elevation of 650'. The rainfall characteristics should be very similar for these two locations.

The DVR gauge station has data from the last 7 years.

Year	Precipitation (In)
2003 - 2004	28.88
2004 - 2005	31.44
2005 - 2006	32.84
2006 - 2007	16.0
2007 - 2008	20.64
2008 - 2009	18.68
2009 - 2010	26.32

The average annual precipitation is 25.0 in which is equal to 2.083 feet.

#### WATER AVAILABILITY

$$Q_E = Q_i - Q_o = 39.3 \text{ acres} \times 0.49 \times 2.083 - 0 = \underline{40.1 \text{ Acre-Feet}}$$

#### ATTACHMENTS

Figure 1 – Tributary Area Map

Figure 2 – Slope Map

Figure 3 – Soil Survey Map



TRIBUTARY AREA  
= 39.3 ACRES



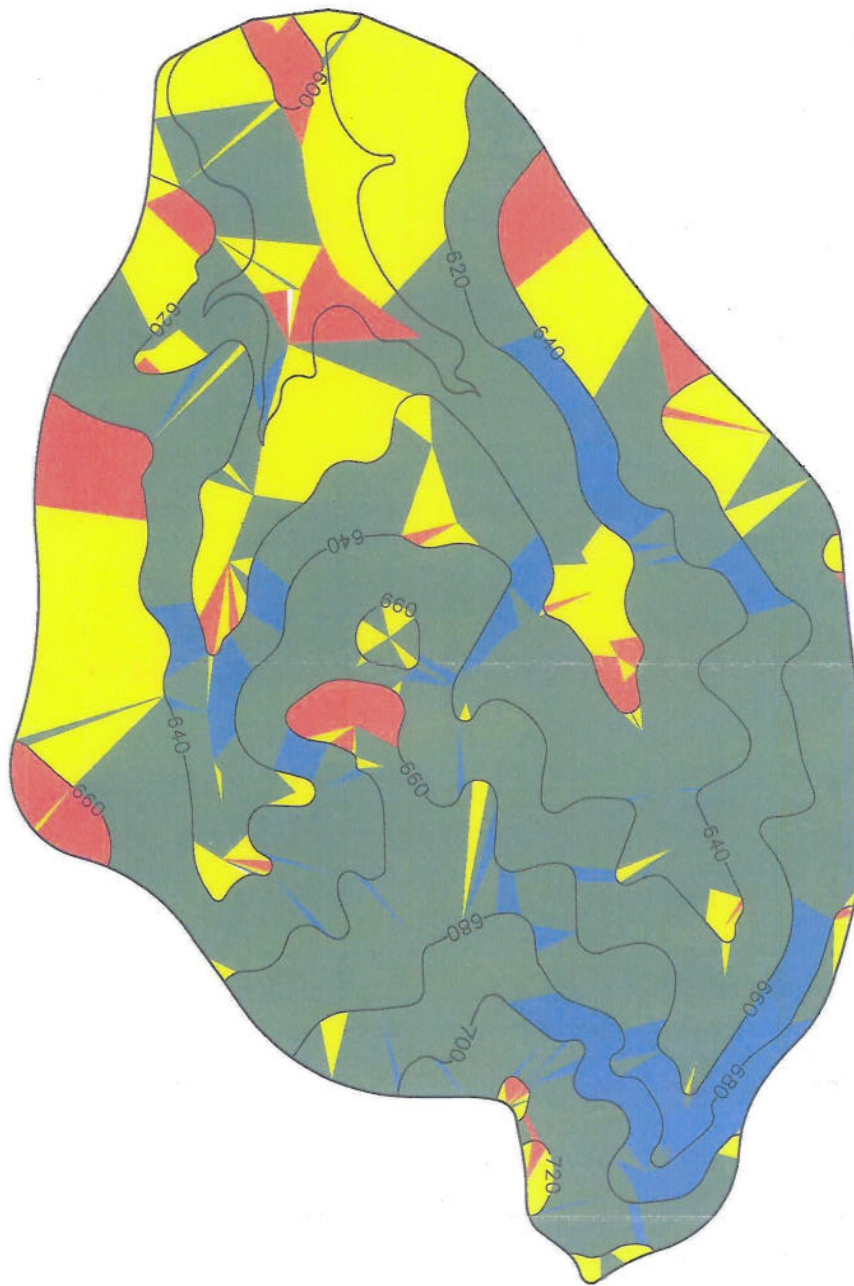
GREGORY POND - WATER SHED ANALYSIS

FIGURE 1 SCALE 1"=200'

TRIBUTARY AREA MAP







SLOPE ANALYSIS RESULTS

Color	Range Beg.	Range End	Percent	Area
■	0.00%	5.00%	7.4%	127393.77
■	5.01%	10.00%	21.4%	366643.10
■	10.01%	30.00%	62.4%	1069962.49
■	30.01%	100.00%	8.7%	149780.29

GREGORY POND - WATER SHED ANALYSIS

FIGURE 2 SCALE 1"=200'

SLOPE MAP














































FIGURE 3



## MAP LEGEND

	Area of Interest (AOI)		Very Stony Spot
	Area of Interest (AOI)		Wet Spot
	Soils		Other
	Soil Map Units		
	Special Point Features		
	Blowout		Special Line Features
	Borrow Pit		Gully
	Clay Spot		Short Steep Slope
	Closed Depression		Other
	Gravel Pit		Political Features
	Gravelly Spot		Cities
	Landfill		Water Features
	Lava Flow		Oceans
	Marsh or swamp		Streams and Canals
	Mine or Quarry		Transportation
	Miscellaneous Water		Rails
	Perennial Water		Interstate Highways
	Rock Outcrop		US Routes
	Saline Spot		Major Roads
	Sandy Spot		Local Roads
	Severely Eroded Spot		
	Sinkhole		
	Slide or Slip		
	Sodic Spot		
	Spoil Area		
	Stony Spot		

## MAP INFORMATION

Map Scale: 1:2,280 if printed on B size (11" x 17") sheet.

The soil surveys that comprise your AOI were mapped at 1:20,000. Please rely on the bar scale on each map sheet for accurate map measurements.

Source of Map: Natural Resources Conservation Service  
Web Soil Survey URL: <http://websoilsurvey.nrcs.usda.gov>  
Coordinate System: UTM Zone 10N NAD83

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Tehama County, California  
Survey Area Data: Version 5, Aug 14, 2009

Date(s) aerial images were photographed: 6/30/2006

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

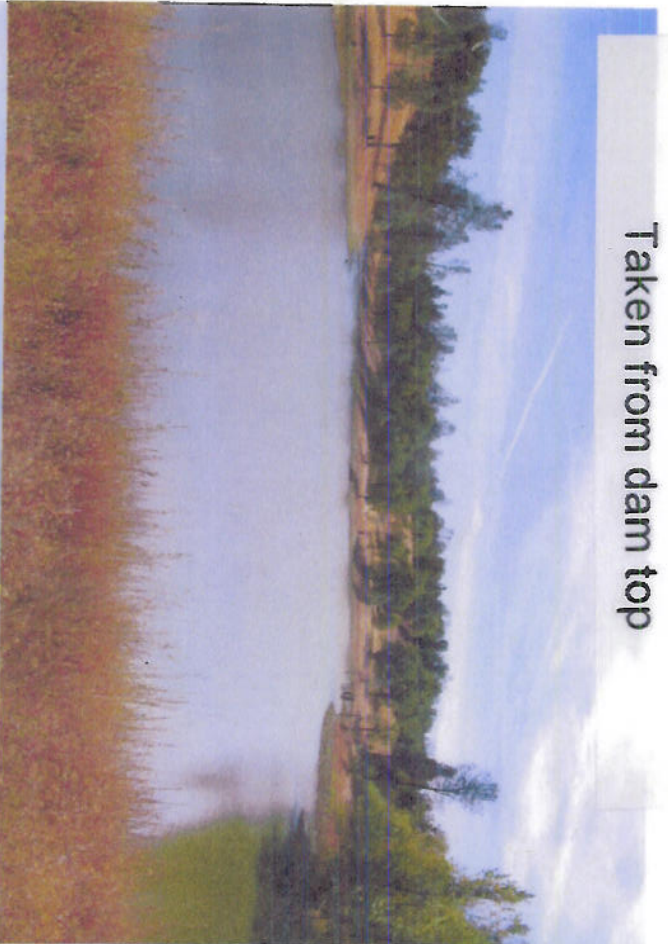
## Map Unit Legend

Tehama County, California (CA645)			
Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
NrE	Newville gravelly loam, 30 to 50 percent slopes	39.5	91.7%
Rg	Red Bluff gravelly loam, 0 to 3 percent slopes	3.6	8.3%
Totals for Area of Interest		43.1	100.0%

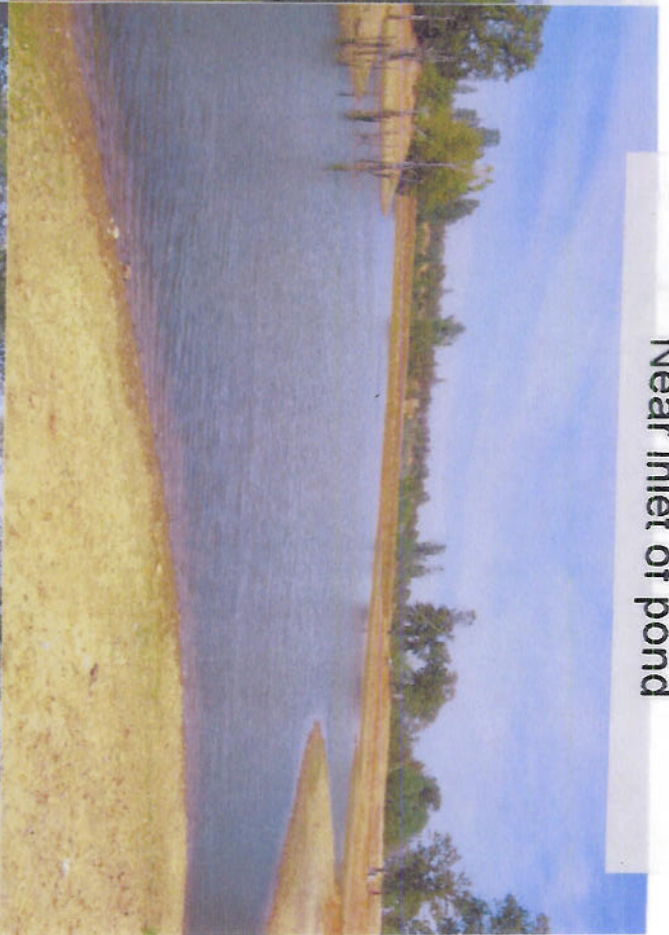


# GREGORY POND

Taken from dam top



Near inlet of pond



Dam



Low flow spillway

